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Superconducting triplet proximity and Josephson spin valves

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Abstract

© 2018, Springer International Publishing AG, part of Springer Nature. A heterostructure comprising several ferromagnetic and superconducting layers acquires functionality of managing the superconducting properties of a system applying external magnetic field. At non-collinear magnetic configurations of the ferromagnetic layers, spin-triplet pairings can be induced in these heterostructures. The triplet pairing channel brings additional degrees of freedom to manage superconducting transition temperature in proximity effect superconducting spin valves. Applied to Josephson junctions' physics, a robust long-range pairing in ferromagnetic weak links produces spin-polarized Josephson currents available for manipulations with magnetic fields and currents. The unique features of the spin-triplet pairings in superconductor–ferromagnet heterostructures make them promising for superconducting spintronics (supertronics).

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Keywords

Josephson effect with ferromagnetic weak links, Spin-triplet pairing, Superconducting spin valves, Superconductor–ferromagnet heterostructures, Superconductor–ferromagnet proximity effect, Thin film nanostructures

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